arms, the shorter arm of which is sealed, a small quantity of water is placed. A column of mercury is introduced next, to separate the water from the outer air, this column being of such length as to bring the water under a total pressure of a few millimeters less than one atmosphere. If the tube thus filled be placed in a bath of boiling water, the water within the tube will boil, and the mercury will be driven outward until it stands at the same height in both arms of the tube, or until the vapor formed has reached its maximum tension. At the same time a small bubble of air will be excluded from the boiling water, which upon cooling can be removed from the tube. If this process of boiling, cooling, and expelling the excluded bubble of air, be repeated until on further boiling no bubble is formed, the water will finally refuse to boil when the tube is placed in the water bath; and in the oil or paraffine bath it can be heated to 130°, as in Donny's experiment, without ebullition. At this temperature vapor is suddenly formed, and the mercury is violently expelled from the tube.* The apparatus then only needs refilling to be ready for a repetition of the experiment.

The writer hopes, with the aid of this very simple apparatus, to make a more detailed study of the superheating of various liquids, and of the attendant phenomena, than has been possible hitherto.

THE UTILIZATION OF MINERAL WATERS.

BY E. H. S. BAILEY.

There has been for the past few years a growing interest in the subject of the purity of water supply. Whether for municipal supply, for boiler purposes, for use in manufactories, or for domestic use, people begin to realize that certain constituents are dangerous, others of no use, and others detrimental. It is difficult to draw the line sharply between potable waters and so-called mineral waters. If we attempt to put a maximum limit to the solid residue that a potable water shall contain, there are numerous mineral waters, acknowledged to be of value, that do not contain a tenth the amount. Again, very hard waters are often richer in mineral constituents than the so-called mineral waters. A mineral water, then, may be defined as one containing an abnormal amount of solids, or containing some unusual constituents. Chalybeate, Borax and Lithia springs belong to the latter class. It often occurs that waters, like those of many of the Saratoga springs, contain 800 to 1,000 grains of solid matter per gallon, and also comparatively rare elements, such as Bromine, Iodine, and Lithia.

Water, the great solvent, has taken into solution — has selected, so to speak, from the variety of material through which it has flowed — certain substances. Though we may make artificial mixtures closely resembling the natural, it is found difficult to exactly imitate nature. An interesting case was up for consideration a year or two ago in the United States Department of Customs. It seems that natural waters are admitted free of duty, while artificial waters are taxed. The Apollinaris Company were anxious to import duty-free; but it was shown by chemical experts that the spring water was salted and surcharged with carbonic acid gas before being bottled, and so became an artificial water. The Secretary of the Treasury, however, overruled the opinion of these experts, and of the Attorney General, and all duties were remitted, much to the disgust of those engaged in bottling American spring waters.

*The apparatus here described is given in some text-books on physics (see Dechanel's Natural Philosophy, part II), its object being to illustrate the tension of vapor formed when a liquid boils under atmospheric pressure. The behavior of the liquid when all air is expelled, as above described, seems not to have been observed.

As the State of Kansas is being developed, new mineral waters are being reported. Springs are discovered, or artesian wells are sunk, often yielding an abundant supply.

Naturally, the attention of the medical profession is called to these as possible curative agents, and we have reason to believe that as valuable waters may be found here as in neighboring States. But not only from a medicinal point of view may it be possible to utilize these waters. The industry of salt making already occupies a prominent position in some sections of the State, and only awaits more capital and the discovery of stronger brines to become of increased importance. We do not know to what extent beds of salt underlie the later rocks of the State. That it may become an important industry here may be gathered from the fact that in the vicinity of Syracuse, N. Y., over 9,000,000 bushels of salt are manufactured in a single season. There is certainly a home market for a large quantity of this material.

In some sections of the country mineral waters are utilized for the manufacture of Borax, of Bromine, and Iodine, and who shall say that even such rare elements as Lithium may not be found in paying quantities? It is well to remember that many substances now counted rare and of little value need but to be cheaply obtained to attain commercial importance.

While it is still a question whether the State has any extensive mineral deposits, and while we cannot boast of pure soft water, it may be possible in many other ways than these that have been briefly suggested, to utilize what we have, and thus aid in developing our latent resources.

ON THE COMPOSITION OF SOME CULINARY UTENSILS.

BY E. H. S. BAILEY.

Much attention is being paid in this country, and still more abroad, to the subject of food adulteration. Under the supervision of boards of health, elaborate examinations of food products are made, and careful tests are executed for suspected adulterations and falsifications. In the United States, some of the more populous States have enacted laws, and created boards for the special purpose of protecting the people against intentional fraud, and criminal carelessness. It is largely the province of the chemist and the microscopist to conduct these examinations. As our population increases, there is more and more temptation to fraud in this direction, so that ultimately all States must protect their citizens.

It often happens that the food itself is of good quality, but becomes poisoned by contact with the vessel in which it is cooked. This leads us naturally to direct attention to cooking utensils and their composition. It is generally conceded that iron and tin can be used for many purposes with perfect impunity. There are, however, cheap grades of tin plate that contain a noticeable quantity of lead. M. Fordos, (Contes Rendue, 79, No. 12,) cites the results of a series of experiments on such ware. Acetic acid, (1 per cent.,) red wine and lemonade, all contained lead after standing in the vessels for some time. Copper and brass can, with a reasonable amount of cleanliness, be used for many purposes, but should never be employed for heating any acid liquids. It is true that many housewives still recommend heating vinegar for pickles in a copper or brass kettle, because, forsooth, it gives them a "natural green" color. They have yet to learn that the copper compound thus formed is a dangerous poison, even if present in small proportions only. The writer had occasion to examine a green pickle for copper, and found $\frac{1}{25}$ of a grain of the metal, equal to $\frac{1}{7}$ of a grain of blue vitriol, in a pickled cucumber weighing a little over two ounces.

Cooking utensils, made of a soft and porous variety of earthenware, are much used